ment of a marine plain or of a wind-swept plain. The writer of this review is familiar with such an eolian peneplain extending from Kittyhawk Bay to the Kill Devil Hills on the North Carolina Coast.

The three chapters following, on the development of shore lines considered as shore lines (1) of submergence, (2) of emergence, and (3) neutral and compound shore lines, carry the burden of the author's plan and leave nothing to be desired in the wealth of material they present or in clearness of treatment. The author's familiarity with the literature of his subject and his detailed first-hand knowledge of shore lines on both sides of the Atlantic have enabled him to present here a solid and enduring piece of work.

The first of these chapters traces the systematic development of the shore line of submergence from its initial stage of extreme irregularity and complexity until it acquires the regular and simple outline characteristic of full maturity. Special consideration is given to those elements of shore form associated normally with the stages of youth and maturity, such as beaches, spits, bar bays, looped and flying bars, tombolos, cuspate bars and forelands, marsh bars, and bay deltas. The various forms discussed are illustrated by ideal diagrams and by maps of examples taken from nature. Features characteristic of the youth, maturity and old age of shore lines of emergence are then described, and special emphasis is placed on those forms which for any reason merit extended consideration. The origin of the offshore bar is fully discussed, and new evidence is presented to test conflicting theories. The history of tidal inlets is traced in some detail; and, in view of their behavior, modifications of the current explanations of offshore bar development are suggested. In a discussion of all these features, the author has held constantly in view those changes that will prove of value to the harbor engineer as well as to the geologist.

Very naturally the consideration of compound and neutral shore lines develops into a discussion of deltas. Beach ridges are also considered.

The last chapter deals with minor shore forms, such as beach cusps, ripple marks, rill marks, swash marks, shore dunes, and artificial beach cusps—all of which should interest the geologist and the engineer as well as the physiographer.

COLLIER COBB

CLIMATOLOGY AND OCEANOGRAPHY OF SOUTHWEST AFRICA

ALFRED FRANZ. **Beiträge zur Ozeanographie und Klimatologie der Deutsch-Südwestafrikanischen Küste nach Beobachtungen von S. M. S. "Möwe."** 41 pp.; maps, ills. *Aus dem Archiv der Deutschen Seewarte*, Vol. 38, 1920, No. 1. Hamburg.

The *Möwe* was used in 1911–1912 to make a survey of the 750-mile coast and narrow continental shelf of German Southwest Africa. The task was no easy one. The ship was tossed about on the large waves that impinge on this practically harborless coast. Surveying parties could hardly be landed through the heavy surf, even with the assistance of expert Togo negroes; and once ashore on the practically rainless desert there was no food or water to be had, and the low cloud or fog every night prevented sighting on stars. These conditions are typical of the desert coasts of Peru and northern Chile and to some extent also of those of Lower California, West Africa (about 12°–30° N.), and tropical Western Australia —all west coastal deserts in the trade-wind zone. The coldness of the coastal waters is responsible for the cool, foggy yet practically rainless climates of these regions. Although the diverted trade winds may blow prevailingly on-shore, the water wells up behind the seaward deflected currents and flows offshore. As the bottom current rides up the continental shelf of Southwest Africa, water at about 14° C. reaches the surface where the depth is 200 meters and at 13° C. where the depth is 150 meters. On the shore the temperature is usually above 12° if the slope of the bottom is relatively gradual, but below 12° if the bottom is steep, as off Lüderitz Bay (minima, 11.2° summer, and 9.7° winter). As the distance from the shore to the edge of the continental shelf (taken as 200 meters depth) is 25 to 60 miles, the seaward rise in water temperature is 1.5° to more than 3° in this distance (cf. R. E. Coker: Ocean Temperatures Off the Coast of Peru, *Geogr. Rev.*, Vol. 5, 1918, pp. 127–135). As would be expected, the cold water area reaches its greatest extent (9°–34° S.) and lowest temperature in August and its least extent and highest temperature in February. In the warmer months the up-welling probably continues, though the intensity of the high sun warms the water appreciably except where the up-welling is most rapid.

The cold coastal water cools and condenses much of the vapor of winds blowing from warmer waters and thus acts much as a mountain range in shutting off moisture from the coast. Uncomfortably low temperatures, much fogginess and cloudiness, especially in the north, prevail in consequence. Rain (drizzle) seldom occurs, for the heating of the air over the land more than offsets the cooling by expansion as the wind rises on the steep coast. Even though the water is coldest in the south (Lüderitz Bay), the air is coldest in the north (Swakopmund). In the south the southerly wind has a shorter transit over the cold water; the wind is more often offshore and therefore hot (heated in part by compression on descending from the interior); and (owing to more land winds) there is less fog and cloud to shut out the sunlight.

CHARLES F. BROOKS

SOILS OF THE SOUTHEASTERN UNITED STATES IN RELATION TO AGRICULTURE

H. H. BENNETT. **The Soils and Agriculture of the Southern States.** xviii and 399 pp.; maps, ills., bibliogr., index. The Macmillan Co., New York, 1921. $3.50. 8 x 5½ inches.

The author (a native of North Carolina and a graduate of the university of that state) has been connected with the U. S. Bureau of Soils since 1903, first as a soil mapper and later as "inspector" of the southern division, and has had exceptional opportunities to study the soils of the area treated, which ranges from Delaware, Kentucky, and Kansas to a little west of the Pecos River in New Mexico and Texas, making a little over a million square miles, or about one-third of the United States.

The treatment is geographical throughout. One of the text figures is a small soil province map of the United States, reduced from the large one in Bulletin 96 of the Bureau of Soils (reviewed in *Bull. Amer. Geogr. Soc.*, Vol. 47, 1915, p. 214), and another figure is the same thing for the southeastern states, on a larger scale with slight revisions. Eight provinces are recognized in this area, viz., the coastal plain, the Great Plains, the Piedmont "plateau," the central prairie region (covering approximately the glaciated or northern half of Missouri), the Appalachian mountains and plateaus, the Mississippi bluffs and silt loam uplands, the limestone valleys and uplands, and the stream bottoms and second bottoms. To treat the last (which is mostly in the coastal plain) as a separate province, as has been done by the U. S. Bureau of Soils for several years past, is objectionable from a geographical standpoint on account of the intricacy and discontinuity of such an area, though the wide alluvial area along the Mississippi River may well constitute a separate region within the coastal plain. The advisability of excluding the loess belt on the eastern side of the Mississippi also from the coastal plain is questionable.

The large colored map in the front of the book subdivides the area more minutely into what are essentially natural regions, about forty in number, each characterized by soils which are of similar origin but differ among themselves in color, texture, moisture, etc. This map is very similar to one by the same author in the section of the Atlas of American Agriculture devoted to cotton, published (under the supervision of O. E. Baker) by the U. S. Department of Agriculture in the spring of 1919; except that it covers a somewhat larger area. It is also comparable with one by E. W. Hilgard at the beginning of the fifth volume of the Tenth Census (1884) and with one by E. A. Smith in the Fourth Report of the U. S. Entomological Commission (1885), both of which are soil region maps in colors, covering the "cotton states."

If the map had been larger and the size of the book unlimited, about twice as many regions could have been distinguished; but of course one has to stop somewhere short of mapping the individual soil types (several hundred in number), and Mr. Bennett has used excellent judgment in this respect.

Any one familiar with the territory described can easily suggest modifications of some of the regional boundaries, but that is inevitable as long as no two authorities agree exactly on the classification of animals or plants or geological formations or anything else. The most obvious possibilities of improvement that occur to the reviewer are that the fertile greensand marl belt of northern Delaware and central Maryland should be separated from the more sandy areas nearer the coast; the long-leaf pine country of southern Alabama and Mississippi should be correlated with the "middle coastal plain" of Georgia rather than with the red hills farther inland; and the long-leaf pine area of western Louisiana and eastern Texas should be distinguished from the pineless country farther west. In these